

NASA PM CHALLENGE 2012 Feb 22-23, 2012 Orlando FL

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ABSTRACT: 250 words; Synopsis: 50 words; Biography: 250 Words; Title: 8 Words

TITLE: Lessons Learned from Shuttle Payload Verification Loads Analysis

ABSTRACT:

When a system experiences a loading environment characterized by rapidly varying forces, such as a rocket launch, a transient analysis is used to analyze the response of the system. The most common transient analysis methodology is the Coupled Loads Analysis (CLA). CLAs are used by the automotive and aerospace industry to analyze cars, trucks, planes, helicopters, spacecraft, etc. The Space Shuttle program also uses the CLA methodology to assess the compatibility of the payload with the Orbiter and the flight environment. The Space Shuttle Verification Loads Analysis (VLA) was a standardized process that started between ten and thirteen months prior to launch, and included several meetings as well as analysis by both the Shuttle Program and the payload developers. Over the course of the Space Shuttle Program, many improvements were made to the process which helped to reduce cycle time and improve manifest flexibility. There were also several issues which were never properly addressed, but a work-around would be developed to keep the process flowing. The lessons learned included automation of some processes and standardization of others, early assessments, improved documentation and better coordination with all stakeholders in the process. Lessons learned also included the limitations in the current process, and what needs to be planned for in the future to avoid the same issues.

SYNOPSIS: Each Space Shuttle flight required a Verification Loads Analysis (VLA) to assess the compatibility of the cargo bay payload complement with the flight environment, and the Orbiter with the payloads. Over the life of the Space Shuttle, lessons were learned in how to handle certain unique situations which arose.